

CLAIMS

What is claimed is:

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1. A method, comprising:

providing a substrate having an active region that has a top surface;

forming a first layer over the top surface, wherein the first layer comprises an oxygen-rich, semiconductor-material layer;

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epitaxially growing a second layer on the first layer, wherein the second layer comprises a semiconductor-material layer; and

converting the first layer to a semiconductor-oxide layer.

2. The method of claim 1, further comprising:

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forming a transistor using the second layer for a channel of the transistor.

3. The method of claim 1, wherein the oxygen-rich, semiconductor-material layer comprises oxygen-rich silicon.

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4. The method of claim 1, wherein the second layer comprises monocrystalline silicon.

5. The method of claim 4, wherein the first layer comprises oxygen-rich monocrystalline silicon.

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6. The method of claim 1, wherein the converting further comprises forming an oxide layer on a top surface of the second layer.

7. The method of claim 6, further comprising:

removing at least a portion of the oxide layer; and

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forming a gate dielectric on the second layer.

8. The method of claim 7, further comprising forming a transistor having a gate over the gate dielectric, a channel under the gate and in the second layer, a deep source and a deep drain in the second layer and laterally spaced from the channel.

5 9. The method of claim 8, wherein the substrate comprises silicon.

10. The method of claim 8, wherein the converting comprises introducing high temperature water vapor over the second layer.

10 11. A method comprising:

providing a substrate having an active region that has a top surface;

forming an oxygen-rich silicon layer over the top surface;

epitaxially growing a monocrystalline silicon layer on the oxygen-rich silicon layer;

and

15 converting the oxygen-rich silicon layer to silicon oxide.

12. The method of claim 11, wherein the converting comprises introducing high temperature water vapor over the monocrystalline silicon layer.

20 13. The method of claim 11, wherein the converting further comprises forming an oxide layer on a top surface of the second layer.

14. The method of claim 13, further comprising:

removing at least a portion of the oxide layer on the top surface of the second layer;

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forming a gate dielectric on the second layer.

15. The method of claim 14, further comprising forming a transistor having a gate over the gate dielectric, a channel under the gate and in the second layer, a deep source and a deep  
30 drain in the second layer and laterally spaced from the channel.

16. The method of claim 15, wherein the transistor is further characterized as having an elevated source over the deep source and an elevated drain over the deep drain.

17. The method of claim 16, wherein the transistor is further characterized as having a source extension between the deep source and the channel and a drain extension between the deep drain and the channel.

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18. The method of claim 11, wherein the substrate comprises silicon.

19. The method of claim 11, wherein the oxygen-rich silicon layer is monocrystalline.

10 20. A method comprising:

providing a substrate;

forming a first layer having a monocrystalline lattice over the substrate, wherein the

first layer comprises a first material of semiconductor type and a second

material, wherein the second material is of a first type different from the

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semiconductor type and occupies locations in the monocrystalline lattice;

epitaxially growing a second layer directly on the first layer, wherein the second layer

comprises a third material of the semiconductor type; and

after epitaxially growing the second layer, converting the first layer to an insulating

layer while retaining at least a portion of the second layer as being of the

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semiconductor type by applying a reactant directly to the second layer.

21. The method of claim 20, wherein the second material is less than about 3% of the first layer.

25 22. The method of claim 20, wherein the second material is oxygen.

23. The method of claim 20, wherein the first material is silicon.

24. The method of claim 20, wherein the reactant comprises high temperature water vapor.

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25. The method of claim 20, wherein the third material is silicon.

26. The method of claim 20 further comprising forming a transistor, wherein the transistor has a channel in the portion of the second layer that is retained as being of the semiconductor type.